

CLAIMS

What is claimed is:

1. A pneumatic valve, comprising:
 - a valve body formed to include a delivery passageway between an inlet
5 and an outlet;
 - a supply reservoir coupled to the inlet; and
 - a diaphragm valve member movable to open and close the delivery
passageway, wherein the interface between the diaphragm and the delivery
passageway is substantially greater than 0.55% of the surface area of the
10 diaphragm.
2. The valve of Claim 1 wherein substantially greater than 0.55% is about 17%.
3. The valve of Claim 1 wherein the delivery passageway includes a nozzle that is
sealed by the diaphragm to close the delivery passageway.
4. The valve of Claim 1 wherein the delivery passageway includes a filter element
15 at the interface.
5. The valve of Claim 4 wherein the filter element has a porosity of about 20 μ m.
6. The valve of Claim 1 wherein the delivery passageway delivers a gas.
7. A valve, comprising:
 - a nozzle having a head for delivering a pressurized supply of a medium
20 to a delivery outlet;
 - a control chamber capable of being pressurized and depressurized; and

a diaphragm disposed between the nozzle head and the control chamber wherein the surface area of the diaphragm communicating with the nozzle head is substantially greater than 0.55% of the surface area of the diaphragm in communication with the control chamber.

- 5 8. The valve of Claim 7 wherein the nozzle is coupled to a filter element.
9. The valve of Claim 8 wherein the filter element has a porosity of about 20 μm .
10. The valve of Claim 7 wherein substantially greater than 0.55% is about 17%.
11. The valve of Claim 7 wherein the control chamber can be pressurized to at least about 22 PSI.
- 10 12. A valve for supplying a flow of a gas, comprising:
 - a gas reservoir for storing a supply of gas at a delivery pressure;
 - an outlet for delivering the supply of gas from the gas reservoir;
 - a nozzle having a head disposed between the gas reservoir and the outlet,
 - the nozzle being pneumatically coupled to the gas reservoir so that gas in the
 - 15 nozzle head is pressurized to the delivery pressure;
 - a diaphragm for actuating the flow of gas from the nozzle head to the outlet; and
 - a timing gas chamber for controlling the diaphragm, the diaphragm sealing the nozzle head when the timing gas chamber is pressurized and
 - 20 releasing from the nozzle head when the timing gas chamber is depressurized, wherein the force exerted on the diaphragm by the pressurized timing gas chamber is substantially balanced by an opposing pneumatic force on the diaphragm.

13. The valve of Claim 12 wherein the gas reservoir and the timing gas chamber are pressurized to the delivery pressures.
14. The valve of Claim 12 wherein the nozzle head includes a filter element.
15. The valve of Claim 14 wherein the filter element has a porosity of about 20 μm .
- 5 16. The valve of Claim 14 wherein the filter element is fabricated from sintered bronze.
17. The valve of Claim 12 wherein substantially balanced comprises having a ratio of the opposing pneumatic force to the timing gas chamber force of less than 1:2.4.
- 10 18. The valve of Claim 17 wherein the ratio is about 1:2 or less.
19. A gas flow device for delivering a regulated flow of a gas, comprising:
 - a housing connectable to a source of compressed gas and having an delivery port for delivering a regulated flow of the gas;
 - a gas flow path within the housing from the source of compressed gas
 - 15 and the delivery port; and
 - a nozzle disposed in the gas flow path, wherein the nozzle includes a filter element.
20. The gas flow device of Claim 19 wherein the filter element is made from sintered bronze.
- 20 21. The gas flow device of Claim 19 wherein the filter element has a uniform porosity.

22. The gas flow device of Claim 19 wherein the gas flow path includes a pneumatic valve, the nozzle forming a part of the valve.
23. A method of making a pneumatic valve, comprising:
forming a valve body to include a delivery passageway between an inlet
5 and an outlet;
coupling a supply reservoir to the inlet; and
positioning a diaphragm valve member movable to open and close the
delivery passageway, wherein the interface between the diaphragm and the
delivery passageway is substantially greater than 0.55% of the surface area of the
10 diaphragm.
24. A method of making a valve, comprising:
providing a nozzle having a head for delivering a pressurized supply of a
medium to a delivery outlet;
forming a control chamber capable of being pressurized and
15 depressurized; and
disposing a diaphragm between the nozzle head and the control chamber
wherein the surface area of the diaphragm communicating with the nozzle head
is substantially greater than 0.55% of the surface area of the diaphragm in
communication with the control chamber.
- 20 25. A method of making a valve for supplying a flow of a gas, comprising:
forming a gas reservoir for storing a supply of gas at a delivery pressure;
forming an outlet for delivering the supply of gas from the gas reservoir;
disposing a nozzle having a head between the gas reservoir and the
outlet, the nozzle being pneumatically coupled to the gas reservoir so that gas in
25 the nozzle head is pressurized to the delivery pressure;

positioning a diaphragm for actuating the flow of gas from the nozzle head to the outlet; and

5 forming a timing gas chamber for controlling the diaphragm, the diaphragm sealing the nozzle head when the timing gas chamber is pressurized and releasing from the nozzle head when the timing gas chamber is depressurized, wherein the force exerted on the diaphragm by the pressurized timing gas chamber is substantially balanced by an opposing pneumatic force on the diaphragm.

26. A method of making a gas flow device for delivering a regulated flow of a gas,
10 comprising:

 fabricating a housing connectable to a source of compressed gas and having an delivery port for delivering a regulated flow of the gas;

 fabricating a gas flow path within the housing from the source of compressed gas and the delivery port; and

15 disposing a nozzle in the gas flow path, wherein the nozzle includes a filter element.